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COMPARATIVE EFFECT OF PLYOMETRIC TRAINING AND CIRCUIT TRAINING ON SELECTED PHYSIOLOGICAL VARIABLES OF PROFESSIONAL TRAINEES

* Dr. Sakti Ranjan Mishra [1] | Palas Biswas [2] | Dhananjoy Banerjee [2]

[1] Ph.D., Former Principal. * Corresponding Author

[2] Research Scholar.

ABSTRACT

The purpose of this study was to compare the effect of Plyometric Training and Circuit Training on selected physiological variables such as Vital Capacity, Resting Heart Rate and Resting Respiratory Rate. Ninety professional trainees, age ranging between 20 to 23 years acted as subjects and assigned to three groups (two experimental and one control group) with 30 students each. The two experimental groups were Circuit Training and Plyometric Training groups. Selected physiological variables were measured before and after training. All the experimental Groups (Circuit training and Plyometric training) were administered with the selected exercises, thrice in a week for a duration of 12 weeks under direct supervision of the researcher. The analysis of data revealed that the two experimental groups, showed significant gains in performance of selected physiological variables after administration of training for duration of 12 weeks. The control group did not show any significant increase in the performance.

KEY WORDS: Circuit Training, Plyometric Training, Vital Capacity, Resting Heart Rate and Resting Respiratory Rate.

INTRODUCTION:

Sports training cannot be equated to physical activity or play activity. Both these activities include physical movements like sports training. Sports training aims at the improvement of performance. Plyometric training is a form of training that offers a huge amount of athletic reward because it develops speed and power through replicating the pace and movement patterns of the chosen sport. Circuit training is a form of body conditioning or resistance training using high-intensity aerobics. It targets strength building and muscular endurance. An exercise "circuit" is one completion of all prescribed exercises in the program. Sports training cannot be equated to physical activity or play activity. Both these activities include physical movements like sports training. The purpose of training programme is to produce metabolic, physiological and psychological adaptations that allow sport persons to perform better. It is formulated in such a way that the sportsman is able to win or at least successfully participate in a competition. Exercise physiology is a scientific discipline that focuses on how an organism responds to exercise. Exercise represents one of the greatest stresses that an organism can encounter. It is perhaps evident that there is a growing realization of importance of physiological variables enhancing the human health and performance. Therefore, physiological variables such as anaerobic power, vital capacity, resting heart rate, resting respiratory rate, lean body weight, body fat percentage and breath holding capacity receive special consideration and it is an important pre-requisite for outstanding performance in sports. With training and conditioning the heart becomes more efficient and is able to circulate more blood while beating less frequently. For a standard amount of work the heart becomes slower is training progress. These heart rate changes indicate a decreasing load on the cardiovascular adaptation to exercise. Blood pressure is also influenced by training. Gemar (1987) concluded that plyometric exercise programme was better than weight training exercise programme in improving leg power as measured by vertical jump, standing long jump and 40 mts. Sprint ability. Barik and Banerjee (1990) viewed that Speed, endurance, strength and agility were increased significantly after training.

The purpose of this study was to determine the effect of a plyometric exercise programme in comparison with a circuit training programme on selected physiological variables of college level volleyball players.

Methodology:

A total of 90 (Ninety) college male students were taken as subjects for the study. All the subjects were the students of Prabharani College of Physical Education, Malda, West Bengal during 2013-14 session. Their age ranged from 20 to 23 years. All the three groups underwent the pre-test on all the parameters, pertinent to the study. The experimental groups underwent their respective training for a period of 12 weeks, as designed under careful supervision of the investigator. The third group served as control and was not allowed to undergo the exercises allotted to experimental groups. After the end of twelve weeks training programme, the three groups underwent post test on all the variables on which pre test was made. To obtain the data pertinent to the purpose of study, the following physiological variables were selected. 1. Vital Capacity, 2. Resting Heart Rate and 3. Resting Respiratory Rate. For measuring Heart Rate (Resting) Stop Watch was being used and the resting heart rate of each of the subjects was recorded between 6.00 A.M. to 7.00 A.M. before recording the resting heart rate, the subjects who were hostellers were instructed to remain lying on their bed. To record the heart rate, the pulse rate was recorded by palpation at the radial artery per minute. The score was expressed in terms of number of pulse beat per minute. The resting Respiratory Rate was measured through Stop Watch and was recorded between 6.00 A.M. to 7.00 A.M. Before recording the resting respiratory rate. The total numbers of respiratory movements per minute were finally recorded. The Vital Capacity was measured by using Dry spirometer and Nose Clip. The spirometer was brought in to zero position. The subject performed maximum inspiration and after clipping the nose, the air was blown out as intensely as possible in the mouth piece. The amount of expired air was read directly from the calibrated scale and that was the score of vital capacity and was recorded in liters.

Findings:

The statistical analysis of data on selected physiological variables of subjects belonging to two experimental groups and one control group, each comprising of thirty subjects, is presented below.

TABLE – 1
(Significance of Difference Between Pre-Test and Post-Test Means and Co-Variance of the Means of the two Experimental Groups and the Control Group in Vital Capacity Performance)

	Groups			Sum of Squares		df	Means sum of squares	F-ratio
	Plyometric Tr. Group	Circuit Tr. Group	Control Group					
Pre–test Means	3.65	3.64	3.55	B	0.18	2	0.09	0.46
				W	16.93	87	0.19	
Post-test Means	3.78	3.88	3.53	B	1.94	2	0.97	5.83*
				W	14.46	87	0.16	
Adjusted post test Means	3.77	3.87	3.55	B	1.61	2	0.80	5.38*
				W	12.89	86	0.15	

*significant at 0.05 level of significance, N=90, B=Between groups, W=Within groups. 'F' ratio needed for significance at 0.05 level of significance =3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Vital Capacity performance indicated that the resultant F-ratio of 0.46 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post test means of all the three groups yielded F-ratio of 5.83, which was significant at 0.05 level of confidence. The difference between the adjusted post- means was found significant as the obtained F-ratio was 5.38.

TABLE – 2
(Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Vital Capacity Performance)

Means			Difference between means	Critical difference for adjusted means
Plyometric Training Group	Circuit Training Group	Control Group		
3.77	3.87		0.10	0.19
3.77		3.55	0.22*	0.19
	3.87	3.55	0.32*	0.19

*Significant at 0.05 level. It is evident from Table-2 that significant difference was found between adjusted final mean of plyometric training group and control group; circuit training group and control group since the difference between means was higher than critical difference for adjusted means. On the other hand insignificant difference was found between adjusted final means of plyometric training group and circuit training group, since difference between means was lower than critical difference for adjusted means.

TABLE – 3
(Analysis of Co-Variance of the Means of two Experimental Groups and the Control Group in Resting Heart Rate Performance)

	Groups			Sum of Squares		df	Means sum of squares	F-ratio
	Plyometric Tr. Group	Circuit Tr. Group	Control Group					
Pre–test Means	64.26	66.16	65.40	B	54.84	2	27.42	1.13
				W	2099.21	87	24.12	
Post-test Means	62.12	63.70	65.03	B	129.40	2	64.70	2.66
				W	2113.96	87	24.29	
Adjusted post test Means	63.03	62.87	64.92	B	77.50	2	38.75	10.96*
				W	303.85	86	3.53	

*significant at 0.05 level of significance, N=90, B=Between groups, W=Within groups. 'F' ratio needed for significance at 0.05 level of significance =3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Resting Heart Rate performance indicated that the resultant F-ratio of 1.13 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all the three groups yielded F-ratio of 2.66, which was insignificant at 0.05 level of confidence. The difference between the adjusted post- means was found significant as the obtained F-ratio was 10.96.

TABLE – 4
(Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Resting Heart Rate Performance)

Means			Difference between means	Critical difference for adjusted means
Plyometric Training Group	Circuit Training Group	Control Group		
63.03	62.87		0.16	0.96
63.03		64.92	1.89*	0.96
	62.87	64.92	2.05*	0.96

*significant at 0.05 level of significance. It is evident from Table 4 that significant difference was found between adjusted final mean of plyometric training group and control group; circuit training group and control group since the difference means was higher than critical difference for adjusted means. On the other hand insignificant difference was found between the adjusted final means of plyometric training group and circuit training group, since difference between means was lower than critical difference for adjusted means.

TABLE – 5
(Analysis of Co-Variance of the Means of two Experimental Groups and the Control Group in Resting Respiratory Rate Performance)

	Groups			Sum of Squares		df	Means sum of squares	F-ratio
	Plyometric Tr. Group	Circuit Tr. Group	Control Group					
Pre–test Means	18.96	19.06	18.80	B	1.08	2	0.54	0.08
				W	589.63	87	6.77	
Post-test Means	16.50	16.76	18.83	B	97.86	2	48.93	7.61*
				W	559.03	87	6.42	
Adjusted post test Means	16.48	16.66	18.95	B	114.06	2	57.03	37.73*
				W	129.99	86	1.51	

*significant at 0.05 level of significance, N=90, B=Between groups, W=Within groups, 'F' ratio needed for significance at 0.05 level of significance =3.10 (2, 87) and 3.10 (2, 86). The analysis of co-variance for Resting Respiratory Rate performance indicated that the resultant F-ratio of 0.08 was insignificant in case of pre-test means from which it is clear that the pre-test means does not differ significantly and that the random assignment of subjects to the two experimental groups was quite successful. The post-test means of all three groups yielded F-ratio of 7.61 which was significant at 0.05 level of confidence. The difference between the adjusted post means was found significant as the obtained F-ratio was 37.73.

TABLE – 6
(Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and Control Group in Resting Respiratory Rate Performance)

Means			Difference between means	Critical difference for adjusted means
Plyometric Training Group	Circuit Training Group	Control Group		
16.48	16.66		0.18	0.63
16.48		18.95	1.47*	0.63
	16.66	18.95	1.29*	0.63

*Significant at 0.05 level. It is evident from above Table that significant difference was found between adjusted final mean of plyometric training group and control group; circuit training group and control group, since the difference between means was higher than critical difference for adjusted means. On the other hand insignificance difference was found between the adjusted final means of plyometric training group and circuit training group since difference between mean was lower than critical difference for adjusted means.

Discussion on Findings:

The analysis of data revealed that the two experimental groups, administered with plyometric exercises and circuit training showed significant gains in performance of physiological variables after administration of training for a duration of 12 weeks. The control group did not show any significant increase in the performance of any variable under study. The plyometric training group showed significantly better gain in performance of subjects in all physiological variables under study. The researcher thinks that these improvements are due to the application of the recommended plyometric training program that led to improve physiological variables. This is in agreement with Hosam El-Din (1994), who indicated that plyometric training aims at improving physiological variables.

Conclusion:

On the basis of the analysis of data, within the limitations of the present study, the following conclusions are being drawn: It was observed that significant differences exist between plyometric training group, circuit training group and control group on Physiological variables after a 12 week of participation on their respective programmes. Both the experimental groups showed significant increase in performance of all the Physiological variables compared to those of control group. But the plyometric training group showed significantly better gain in performance of subjects in all physiological variables under study. The results of the study coincided with the general conception that both plyometric training and circuit training improve cardio-vascular endurance, agility, muscular strength and endurance of the players in a progressive manner.

REFERENCES:

1. Banister, E.W., (1965). "A Comparison of Fitness Training Methods in a School Programme", *Research Quarterly*, **36:4**, p. 387.
2. Barik,A.K. and Banerjee,A.K. , (1990). "Effect of Six Weeks Conditioning Programme on Some Performance Variables Among Tribal Students", *Journal of Physical Education*: Sports Authority of India, **11:11**, p. 37-39.
3. Bowers ,Richard and Fox, Edward: Sports Physiology, 3rd Ed. Dubugue: W.C. Brown Publishers 1992.
4. Dintiman, Geroge, B. (1964). "Effect of Various Traiing Programmes on Running Speed", *Research Quarterly*, **35:4**, p. 368.
5. Gemer, J.A., (1987). "The Effects of Weight Traing and Ploymetric Training on Vertical Jump, Standing Long Jump, and Forty meters Sprint", *Completed Research in Health, Physical Education and Recreation,* **29**, p. 25.
6. Harre, Dietric (1982). *Principles of Sports Training*; Sportverlay, Berlin, p. 10.
7. Hosam El-Din, T., 1994. "Motor and Functional Bases of sports training". Dar Al-Fikr Al-Araby, Cairo, Egypt, pp: 131. (In Arabic).
8. Norell, Philip Monk (1987). "The Effect of an Eleven Week Super Circuit Exercise Programme on Selected Physiological and Psychological Measures of University of Alabama Police Officers", *Dissertation Abstracts International,* **47:6**, p. 2086-A.
9. Reh, Johanne "Introduction into Sports Biology", (Leipzing : German College for Physical Culture.1972). P. 161.
10. Richard Bowers and Edward Fox, (1992). *Sports Physiology*, 3rd Ed. Dubugue: W.C. Brown Publishers, p. 226-227.